

AD-A061 221

NATIONAL PRESTO INDUSTRIES INC EAU CLAIRE WIS
PROCESSES FOR PRODUCTION AND INSPECTION OF 105 MM XM710E1 METAL--ETC(U)
APR 78 C W KRAUSE

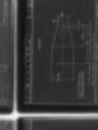
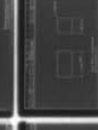
F/G 19/1

DAAK10-78-C-0005

NL

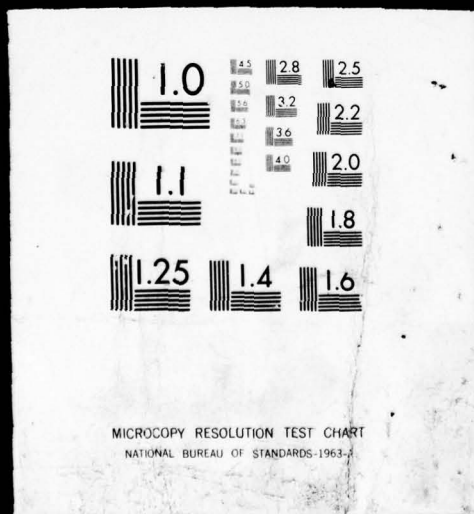
UNCLASSIFIED

1 OF 3
AD
A061221



1. OF 3

AD
A061221

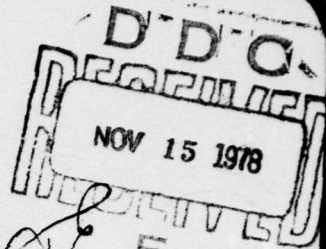


PRESTO®

NATIONAL PRESTO INDUSTRIES, INC.

Eau Claire, Wisconsin 54701

Area Code 715-839-2121



DISCLAIMER NOTICE

**THIS DOCUMENT IS BEST QUALITY
PRACTICABLE. THE COPY FURNISHED
TO DDC CONTAINED A SIGNIFICANT
NUMBER OF PAGES WHICH DO NOT
REPRODUCE LEGIBLY.**

AD A061221

DDC FILE COPY

PROCESSES FOR
PRODUCTION AND INSPECTION OF
105MM XM710E1 MPTS.

CONTRACT DAAK10-78-C-0005

78 10 19 076

(This page left blank intentionally)



9
**FINAL TECHNICAL
REPORT.**

CONTRACT 15 DAAK 10-78-C-0005

6
PROCESSES FOR PRODUCTION AND INSPECTION OF
105 MM. XM 710E1 METAL PARTS ASSEMBLY.

(PROJECTILES).

10 C. W. / Krause

By

11 30 Apr 78

12 243 p.

NATIONAL PRESTO IND., INC.
EALI CLAIRE - 54701 - WISC.

243 450

JOB

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

TABLE OF CONTENTS

TITLE PAGE - - - - -	Page #1
COVER SHEET - - - - -	Page #2
DOCUMENT PAGE - - - - -	Page #3
FRONTSPIECE - - - - -	Page #4
SIGNATURE PAGE - - - - -	Page #5
DISCLAIMER - - - - -	Page #6
INTRODUCTION - - - - -	Page #7
PRIOR ACTIVITIES - - - - -	Page #8
FORWARD - - - - -	Page #9
RECOMMENDATIONS - - - - -	Page #10
CONCLUSIONS - - - - -	Page #11
PROBLEM AREAS - - - - -	Pages #12 - #17
GENERAL REPORT DATA SHEET - - - - -	Page #18
BODY SKETCH - - - - -	Page #19
SECTION A. SPECIAL CATEGORIES - - - - -	Pages #20 - #33
SECTION B. SEQUENCE OF OPERATIONS & FLOW CHART - -	Pages #34 - #41
SECTION C. OPERATION PROCESS SHEETS - - - - -	Pages #42 & #43
OPERATIONS #10 - #245	
SECTION D. MANUFACTURING DESCRIPTION OF	
OPERATIONS AND INSPECTION - - - - -	Pages #44 - #62
SECTION E. IN PROCESS INSPECTION BY ATTRIBUTES - -	Pages #63 - #78
SECTION F. FINAL INSPECTION BY ATTRIBUTES - - - -	Pages #79 - #91
SECTION G. MISCELLANEOUS INFORMATION - - - - -	Pages #92 - #95
SECTION H. REFERENCE SECTION - - - - -	Pages #96 - #98
DISTRIBUTION LIST - - - - -	Page #99
DATA FOR SEARCH & ANALYZE - - - - -	Page #100

APPROVED FOR	File Section <input checked="" type="checkbox"/>	B.I. Section <input type="checkbox"/>	DISTRIBUTION/AVAILABILITY CODES SPECIAL
JCS	<i>on file</i>		
NAVJAG			
JCS 100-104			
BY	A		

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

TO

COMMANDING OFFICER
PICATINNY ARSENAL
DOVER, NEW JERSEY 07801

ATTENTION

ARRADCOM-DRDAR-LCU-P

FROM

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

SUBJECT

DESIGN PRODUCTION LINE XM710E1
CONTRACT DAAK10-78-C-0005

FINAL TECHNICAL REPORT

1 May 1978

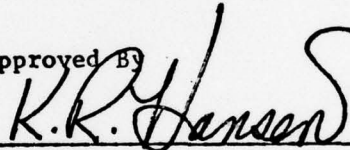
REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER Final	2. GOVT ACCESSION NO. Unknown	3. RECIPIENT'S CATALOG NUMBER NA
4. TITLE (and Subtitle) Processes for Production and Inspection of 105MM XM710E1 Metal Parts Assemblies - Projectiles		5. TYPE OF REPORT & PERIOD COVERED Technical Report - Final
6. AUTHOR(s) C. W. Krause		6. PERFORMING ORG. REPORT NUMBER Final
7. PERFORMING ORGANIZATION NAME AND ADDRESS National Presto Ind., Inc. Eau Claire, Wisconsin 54701		8. CONTRACT OR GRANT NUMBER(s) DAAK10-78-C-0005 ✓
9. CONTROLLING OFFICE NAME AND ADDRESS Picatinny Arsenal - Dover, NJ 07801 ARRADCOM-DRDAR-LCO+P		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS Unknown
11. MONITORING AGENCY NAME & ADDRESS (if not from Controlling Office) DCASR-ACO-DCASMA Milwaukee, Wisconsin 53203 Mr. R. W. Dietzler		12. REPORT DATE 30 April 1978
		13. NUMBER OF PAGES
		14. SECURITY CLASS. (of this report) Unknown
15. DISTRIBUTION STATEMENT (of this Report) Per contract		16. DISCLASSIFICATION/DOWNGRADING SCHEDULE Unknown
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 22, if different from Report) Per contract		
18. SUPPLEMENTARY NOTES Government Data - As recorded and available. Page of this report.		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) HOT CUP-COLD DRAW - HCCD or HoCo		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) National Presto Ind., Inc. began work on this contract 1 November 1977. The contract required paper study and recording of an in theory process and inspection concept deemed capable of producing the 105MM XM710E1 MPTS. These data and related government paper follow as noted.		

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

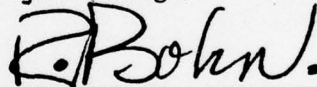
CONTRACT DAAK10-78-C-0005

SIGNATURE PAGE

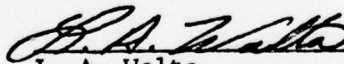
Approved By



Ken Hansen
Project Manager



Roger O. Bohn
Project Engineer



L. A. Walta
Q. C. Supervisor

Written By



C. W. Krause
Ass't. to Project Manager

National Presto Ind., Inc.
Eau Claire, WI 54701
Tel - 715-839-2121

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

DISCLAIMER

This report identifies certain brand names which are used herein since the facility or item represents a product basically oriented to the operations concerned and listed or as currently conceived. The citation relative to the above trade names does not constitute any endorsement or approval for use of these items or facilities related thereto.

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

INTRODUCTION

Performance of the contract requirements were governed by the terms and conditions oriented to the Scope of Work and the related Technical Data Package. Contract DAAK10-78-C-0005 was formally initiated 1 November 1977 by National Presto Ind., Inc. at the Eau Claire Wisconsin Plant.

The Work Scope covers the requirements for generating process specifications to produce and inspect the 105MM, XM710E1 Projectile according to the contract and MIL-C-63076(AR) dated 15 June 1977 as deemed applicable. The total involvements cover the supporting paper for the production and inspection processes and does not require costing elements, manpower analysis, finalized drawings, technical computations and/or other in depth OSHA support paper.

SPECIAL INFORMATION NOTE:

Data relative to the subject 105MM XM710 Projectile was requested from the Government records but has never been received, hence this report was prepared without benefit of proven documentation developed and in use for manufacture of the 155MM and 8 Inch ICM ammo.

Careful search of Government approved records should be considered in order to avoid duplicate effort of technical data development as well as eliminate costs accumulated therefrom and without benefit.

Proven developments with various other items of this conceptional configuration should be considered for application on this shell and are possibly a part of the following list:

- a. 1340 Steel Processing
- b. Band/Body Application & Machining
- c. Band Weldment Analysis
- d. Magnetic Particle Analysis
- e. Ultra-sonic Inspection
- f. Automated Gaging
- g. Any other newer developments applicable.

Incorporation of any of the above would cancel the commensurate or comparable processes though listed or expounded on herein.

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

PRIOR ACTIVITIES

National Presto Industries, Inc. was founded in 1905 and has been actively engaged in metal fabrications of distinction and assemblies of merit thru this date.

Beginning with World War II, "Presto" has continually served the Government in the manufacture and delivery of Aircraft Assemblies and various Ordnance Items, especially fuze, cases and projectile medias.

Active association and participation include the entire phases of research and development as well as the related productions associated therewith.

Production line concepts automated and conveyORIZED to sustain high rates of quality products have continually maintained efficiency and quality levels unsurpassed. Many of these qualify as "first" in U. S. histories.

Expertise gained from operational and production management, including selection, procurement, and installation of the support facilities related thereto have provided the reasoning for the production and inspection criteria selected and listed herein.

Personnel with multi-year experiences in shell production and engineering have administered to project search and the applications as presented.

Activities related to the subject contract have been limited to data collection and screening for presentation per RFQ-DAAK10-77-0080 requirements. Related topic reviews with government agencies and steel suppliers have been perused for preliminary item concept and feasibility application wherever possible. Cold draw of the part should be envisioned as one of complexity and should be considered for "in depth" operational requirements and sequencing.

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

FORWARD

The manuscript as prescribed herein follows the concepts envisioned by the mandates of the contract -- limitations of cost and time adversely affect an in depth study.

The contract, as written, included the body and band overlay and excluded the base plug and its assembly as well as load, assemble and subsequent packing.

Work scope and cost evidences resulted in the selection of AISI-1340 steel as well as cold shearing for shell mult size and weight.

Selection and listing of certain production facilities already government-owned are noted collectively by operation and separately by site or depot.

The Hot Cup-Cold Draw Processes and techniques as developed by National Presto Industries, Inc. for mass production are incorporated wherever possible.

Facilities available for production of the standard 105MM, HE, M1 Projectile can be made available on a "use as is" status or modified to suit the shell characteristic variants. Certain pieces of new equipment are required because of their producibility and overall cost effectiveness.

The various categories making up this report are individually listed for ease of removal should their requirement be desired for use or in aggregate as report presented.

Physical manufacture of parts, machine setup, tooling and/or process proveout were not a part of the overall contract requirements as written.

Progress reports one (1) thru five (5) were issued and forwarded on a monthly basis as contract stipulated.

See Page #7 - "Special Information Note."

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

RECOMMENDATIONS

Planning for this item should include an in depth search relative to actual need, performances required and, in general, the real world producibility, cost and effectiveness rationale.

If actual production is envisioned and scheduled, a production line prototype should be considered with metal part fabrication and related processes correlated for a final production line composite. Absence of proven and usable support data for this item strongly indicates the need for further technical and engineering study at the parts fabrication or line production concept level.

The internal configuration, while probably difficult to produce, might be considered for larger calibre use since the design should provide both positive location and definite security for internal stores configurations and/or other LAP medias.

A review of the overall dimensional characteristics is in order for possible relief in tolerancing and general specification limitations. Dimensions fixed by tooling should be expanded to provide for expeditious inspections, improved production modes and, as a result, reduce item cost.

A strong forge and draw tool program should be considered for early effort and proveout. It is felt that these operations could make or break a program of this complexity.

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

CONCLUSIONS

✓ The projectile per Contract DAAK10-78-C-0005 and MIL-C-63076(AR) dated 15 June 1977 as well as drawings #92298226 and #92298225 provide for shell components never produced in a line concept mode. The internal configurations make for a complex and complicated item when equated to the overall shell dimensional configurations.

Further engineering and technical study or production efforts should be carefully evaluated for validity and cost effectiveness.

→ The Hot Cup-Cold Draw Processes generate the fundamental basics for forming the complex rib configurations. However, actual numbered productions are required for verification of the internal size and shape parameters and their subsequent retention in the actual end item part.

Engineering and Technical evaluation of the processes listed herein should be reviewed for commonality or adaptability to the specific vendor operations and concepts or installation subsequent to commitment. ↑

Government information pertaining to projects of related nature should be made available to the Contractor or probable Vendor.

In today's technology, a quality control system could function as follows dependent on funding available.

Partial verification or the hundred percent inspection of dimensional characteristics could be accomplished by automated air/electronic gaging after basic machining of the unit.

Instrumentation could provide visual registration of characteristics being analyzed. Memory circuits feeding the readouts into product control or computer banks could provide storage or playback of the data as required.

Defective work could be handled in several varied modes, all of which distribute or identify the units for disposition, either rework or scrapout as designated.

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

PROBLEM AREAS

ANTICIPATED PROBLEM OPERATIONS ASSOCIATED WITH
THE 105MM XM710E1 PROJECTILE MANUFACTURING AND
INSPECTION REQUIREMENTS.

Problem conditions as written herein may have already been solved by development data currently covered by Government contract or other documentation.

Your attention is again directed toward individual reader concepts of this information which should be dealt with in an open frame of mind, time, place and conditions considered.

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

PROBLEM AREAS

Problem areas anticipated with the development of the formal production processes and the related quality control criteria for support thereof.

This data will be dealt with in accordance with the operational sequence programming.

FORGE & HOT DRAW - OPERATION #40. See Page #7.

TOOL LIFE - PUNCHES & DIES.

The basic inside contours are cause to envision a major development period for ironing out the prescribed die/punch combination suitable to make and hold the internal configurations.

The situation is delicate but not impossible since the four station Bliss Forge Press System should provide suitable operation progression to produce acceptable parts.

Metal conditioning at this operation could also be a problem because of the proportional work stations and their relation and reaction to the progressional work sequence.

COLD DRAW - OPERATION #90. See Page #7.

Where as this work is basically a size-draw combination, it does lend itself to a complexity of tool design and work load apportionment. Hopefully, Operation #40 will provide the major shaping work load and allow for the predicted percentages of ironing and shaping at this, the final internal cold work operation.

WELD BAND - OPERATION #140. See Page #7.

Machinery used for this operation with the related operator responsibility becomes a major factor of prime concern as related to producibility and quality of this projectile.

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

WELD BAND - OPERATION #140 (continued)

Technical engineering response to problem expectations at this operation have already been dealt with in detail thru several technical government reports. This expertise is certainly well founded and would serve no purpose being repeated in this report. Titles and dates are not available.

The present weld overlay techniques used and approved for the various 155MM and 8 Inch configurations should serve as a base for project concept. Follow on work would then consist of those requirements necessary for machine selection, familiarization and general production learn curve expectancies.

Weld overlay data listed and current to usable concepts for this item might be available in the 9 May 1973 publication "Process Recommendations for Banding the 4.2 Inch, HE, M329 Projectile," Document No. 11738359 - also listed as Addendum No. 1 dated 1 August 1975.

No further discussion relative to this subject is deemed necessary since a time/place condition exists - data current to date and this procurement could be obsolete at time of actual procurement action for this item.

HEAT TREAT - OPERATION #160. See Page #7.

Heat treatment of this item can be considered as a border line problem area.

Good equipment and a consistent quality part for heat treat could provide the control necessary.

Heat treatment of the item has been envisioned as adaptable to induction or induction scan methods.

Some development will be required for both methods and may require a combination of adjustments and revised thinkings in order to obtain the end item results for mechanical property acceptance.

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

HEAT TREAT - OPERATION #160 (continued)

Reference to this report operational requirements as listed can be found on the Operation Process Sheets, Operation #160, Section "C" which should further serve for operational familiarization.

GENERAL INFORMATION.

Heat treating of the projectile consists of harden, quench, and temper operations which are essential in developing required mechanical properties.

Furnaces for hardening and tempering are induction type with controlled atmosphere to minimize scale formation. Projectiles are automatically placed in the hardening furnace by a mechanical conveyor system. After the hardening cycle is completed, the projectile is discharged into tanks containing salt quench or another flame-resistant fluid which quickly reduces its temperature. After quenching, the projectile is automatically conveyed into the tempering furnace where stabilization of its structure is accomplished. Time and temperature for harden, quench, and temper operations are dependent upon steel chemistry and specified mechanical properties.

MACHINING OPERATIONS - GENERAL.

Whereas the general machining tolerances are considered exceedingly tight, as print viewed, actual production will find the tolerances and dimensions even more so.

Some change requests can be expected in order to provide effective production and cost benefits. Some of these categories will generate from tool and operational concept changes as well as from the benefits of production experiences.

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

POSITIVE LOCATION.

Particular attention should be given to the concepts of use for establishing positive location points. These points are areas affording positive and continued location areas for as many operations as possible. Developed locations herefrom are secondary and of equal dependence.

Location points.

1. A fixed or final dimension.
2. Use of identical or the same location points for as many operations as possible.
3. Use of developed location points from preceding operation such as those above.

BAND ANALYSIS - OPERATION #147. See Page #7.

PARA. 4.5.3. - BAND CHEMICAL ANALYSIS. MIL-C-63076(AR)

Chemical analysis of the band properties contents must be considered as one of the operations or requirements mandating major concern and invitational to a major revision.

Present specifications indicate a detailed laboratory procedure for band chemical analysis and apportionment of chemical content. Analysis concepts presently used at sites currently in production were not available for study and therefore cannot be commented on. General improvement in procedure and elapsed times involved for processing the band requirements therefore seem in order.

A possible solution for both time and cost seems evident with the Atomic Absorption Spectroscopy Process.

Cost of this installation would be less than \$20,000. Time required for a four element readout as contemplated not to exceed one (1) hour. Multi-element incorporation could reduce both time and cost as noted above.

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

BAND ANALYSIS - OPERATION #147 (continued)

Vendors cognizant of this process and already furnishing comparable equipment are noted as follows:

- a. Perkins-Elmer
- b. Varian Techtron
- c. IL
- d. Beckman
- e. Unicom

Units of this magnitude are already in use and approved for commercial use in chemical analysis of material common to these band oriented.

PAR. 4.5.2 - MAGNETIC PARTICLE. MIL-C-63076(AR) See Page #7.

Whereas this test is not new, the categories for acceptance or rejection constitute a field of characteristics generally finalized by trial and error thru production. Since this shell has never had experiences for determination of these characteristics, comments regarding same would be of little credence.

With this in mind, the best equipment available should be selected for program use.

Automations covering these facilities are limited, if at all, and therefore could be considered. Several vendors, all commonly known, are available for this type of study. Picatinny has indicated the possibility of some study work already in progress, however, verification of same was not forthcoming.

The progress of Electronic Inspection Concepts for inspection criteria of this nature should be further pursued. This is being done at Picatinny, however, actual progress and results were not available for release at this time.

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

GENERAL REPORT DATA

The following pages contain the general data information pertaining to the contract, the subject 105MM XM710E1 Projectile, and the related parameters generated for support thereof.

Future use of this data should be closely scrutinized for compatibility to the particular project work scope and all other parameters attributable to the tasks contract oriented.

Incorporation of the complex Engineering, Production and Quality Control factors to a viable producing facility must be considered as a major effort of planning and projection.

The data pages herein are equally apportioned for aggregate review or removable by section for expeditious purposes for single portion use or for report perusal and/or general use.

The sections are generally as follows:

Problem Areas

A. Special Category Items

1. Steel
2. Cold Shear
3. Electronic Gaging
4. Air Gaging & Other

B. Processes & Operations

1. Process Flow Chart
2. Operation Sequence & Equipment
3. Operational Sequence

C. Operation Process Sheets

"Raw Material thru Finished Shell"

D. Manufacturing - General Description
of Operations and Inspections

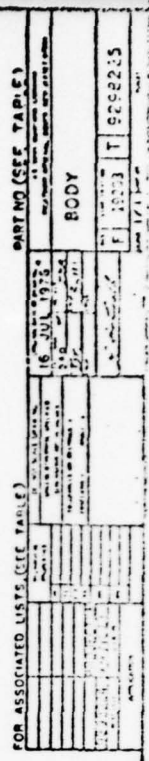
E. In Process Inspection by Attributes

F. Final Inspection by Attributes

G. Miscellaneous Information

1. St. Louis Equipment List
2. St. Louis Equipment Planned for use
3. New Equipment Required

H. Reference Section



~~PAGE #19~~

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

SECTION "A"

SPECIAL CATEGORIES

CATEGORY #1. STEEL

RAW BAR STOCK

CATEGORY #2. COLD SHEAR

BAR STOCK TO MULT SIZE

CATEGORY #3. ELECTRONIC GAGING

IN PROCESS OR FINAL INSPECTION

CATEGORY #4. AIR GAGING - SEMI OR AUTOMATIC

IN PROCESS OR FINAL

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

CATEGORY #1

STEEL - RAW BAR STOCK

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

CATEGORY #1. STEEL - RAW BAR STOCK.

Body Material - AISI 1340 and the attributes related to its spectrums for procurement and general information pertaining thereto are as follows:

Material Specifications

AISI - 1340 Steel
MIL-S-16974
Hot Rolled Steel

AISI - 1340 Steel

The above steel was selected primarily because of price differential favoring the 1340 steel by as much as \$5.00 per hundred weight.

The 3½" RCS (Round Cornered Square) was selected because of Contractor experience and its compatibility to the forged operational tools, resultant parts, and subsequent shaping operations.

Quoted prices as listed below are of time and place variant and readily subjected to escalations and/or other conditions affecting price. Therefore, the figures as posted are a reference only and should be handled accordingly.

MIL-S-16974 E AISI-1340 Hot Rolled Steel

	<u>3-1/2 RCSQ</u>	<u>4 RCSQ</u>
Base	\$19.30	\$16.70
Grade	1.25	1.25
Shell Quality C	.50	.75
Cold Shear Quality	1.40	1.40
Size	.80	1.25
	<u>\$23.25 CWT</u>	<u>\$21.35 CWT</u>

NOTE: Either 3½" or 4" RCS could be used if originally designed and tooled for accordingly.

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

CATEGORY #1 - STEEL - RAW BAR STOCK (continued)

MIL-S-6758-A EF AISI-4130 AIRCRAFT QUALITY
VACUUM CARBON DEOXIDED HOT ROLLED STEEL

	<u>3-1/2 RCSQ</u>	<u>4 RCSQ</u>
Base	\$19.30	\$16.70
Grade	3.40	3.40
Electric Furnace	1.25	1.25
Aircraft Quality	2.00	2.00
Shell Quality C	.50	.75
Cold Shear Quality	--	1.40
Size	.80	1.25
	<u>\$27.25 CWT</u>	<u>\$26.75 CWT</u>

AISI - 1340 STEEL (continued)

All prices are quoted F.O.B. South Chicago, IL, subject to price in affect at the time of shipment and subject to our Trade Customs and Condition of Sale.

The following specification listing could serve as that information appropriate for procurement action for material purchases.

STEEL SPECIFICATION - 3-1/2" RCS FOR XM710E1 SHELL

MATERIAL:

AISI 1340 fine grained, fully killed, non-aging. Must be suitable for hot cup-cold draw process. Material must be in an annealed condition suitable for cold shearing into mulsts. Final end item will be subjected to 100% magnetic particle inspection. Mechanical properties of the finished projectile are listed as follows:

- A. Y.S. - 160,000 psi at 0.2% offset.
- B. 10% min. elongation in one inch.

SIZE:

3-1/2" RCS, 1/2" corner radius, diagonal 4.536".

LENGTH:

Full bar equal to 20 feet, 9 15/16" minimum and advisory. 15% short bars acceptable with length to be established by user. Both ends to be square and can be hot or cold sawed or machine torch cut.

NOTE: Vendor preference or operations could change above callouts.

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

CATEGORY #1 - STEEL - RAW BAR STOCK (continued)

STEEL SPECIFICATION (continued)

SPECIFICATIONS: ASTM-A711 and MIL-S-16974.

MACROETCH: MIL-STD-430. Center defects shall not exceed A5; subsurface defects shall not exceed B3; ring defects shall not exceed C8; and miscellaneous defects other than D2 shall not be acceptable. Vendor to furnish the macroetch samples to buyer.

CERTIFICATION: Four (4) notarized copies of Chemical and Macroetch Examination Report qualifying the steel to ASTM-A711 shall be sent to buyer.

SHIPPING INSTRUCTIONS: To be shipped in open gondola cars to permit overhead unloading by magnetic crane. Dunnage required between layers. Heat marker bars are to be marked red (first), white (middle), and blue (last).

OTHER INSTRUCTIONS: The above is applicable as noted unless otherwise amended by buyer for specific purposes with another specification or change order and approved by Engineering and Purchasing.

Some caution must be used, however, with selection of the vendor and administration of the actual responsibilities for steel extras between supplier and user. These details should be carefully and thoroughly attested to in order to avoid the stigma of the "Who Done It" probabilities and other questionable conditions seemingly arising from material - raw bar stock.

NOTE - STEEL QUALITY - The particular steel and operations attributable thereto have been selected because they were considered processable with our format and procedures for manufacture.

Other vendors could consider other steel grades, different processes and operations and produce equally acceptable end item parts.

NOTE: Consider the above steel for startup purposes - specification changes for price reduction should follow.

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

CATEGORY #2

COLD SHEAR - BAR STOCK TO MULT SIZE

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

CATEGORY #2 - COLD SHEAR - BAR TO MULT.

A Buffalo #625 Shear with special gaging and auto. length adjustment is envisioned for use. The unit, a "cold shear press" will part 3½" RCS - 1340 Steel to 6.11" length at a rate of twenty-two (22) pieces per minute. Efficiencies of 86 percent can be expected with kerf losses zero (0) and crop losses about 1.4 percent and further reducible to 0.8 percent by salvage saw use for end recovery.

Automatic equipment to unscramble the bar bundles and load/feed the shear constitute about 28 percent of the \$337,188.00 unit price.

Cold Shear System Credits follow:

1. Operational independent of forge system to provide inventories and flexibility of system.
2. Stoppages of either forge or shear system will not affect each other for greater efficiencies of both systems.
3. Maintenance more flexible, simplified and more readily planned for.
4. Heat (energy) not wasted in scrap or cropped losses as Hot Shear System.
5. Descalers not required.
6. Bar straightness tolerances can be relaxed for reduced bar tonnage costs.
7. Mult feeding and heating systems already proven - eliminate bar damage factors of Hot Shear Bar Induction Heat System.

1340 Steel as listed for procurement will satisfy the cold shear requirements and not induce problems in subsequent operations.

General Note:

Unless a new installation for this shell - space and funding could become a major factor in the Hot Shearing concepts and adaptations.

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

CATEGORY #3

GAGING ELECTRONIC

- A. OUTSIDE DIAMETER & ENDS
- B. INTERNAL CONFIGURATIONS
- C. PRICING ESTIMATES

NOTE: A combination of memories, storage
and printout facilities is also
available.

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

CATEGORY #3 - GAGING ELECTRONIC - 3.667 I.D. x 9.900 Depth

DIMENSIONAL MEASURING/GAGING

The Alina-Pretec Electronic Gaging System is designed to measure a particular dimension or dimensions in comparison to pre-determined specifications.

The actual measurement is taken from the linear variable differential transformer which is used as the measuring sensor or probe. The electronic signal is fed to the basic measuring element called amplifier and from there to the meter for visual display.

The modular gaging system consists of a variety of building block modules - as 10 dimension check would have 10 measuring sensors or probes

	10 amplifiers	
or	1 multi-station panel meter	undersize)
	10 signal light unit (showing	good
		oversize)
or	analog - graph strip chart recorder	
or	digital - readout	

NOTE: Gaging fixture required for shell will support the measuring sensors or probes as per area or operation performed as per process assurance requirements.

All of the above electronic gaging modules can be directly interfaced with the Hewlett-Packart Programmable Desk Calculator. With basic features:

Digital Display & Alphanumeric Printer

- (1) Digital Display on calculator of either
 - a. Absolute dimension
 - b. Deviation from the nominal
- (2) Alphanumeric 16-character thermal printout of either
 - a. Absolute dimension
 - b. Deviation from the nominal
 - c. Operator instructions
 - d. Labeled & identified output

The above deals primarily with the outside diameter and open ends and can be arranged in combination to suit multiple customer requirements.

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

CATEGORY #3. ELECTRONIC GAGING - INTERNAL CONFIGURATION.

CAVITY - PRETEC PROGRAMMABLE MEASURING SYSTEM.

This system has special head for cavity configuration which is fitted with twelve (12) standard cartridge probes. The pattern of sequence of operation for this system would give a choice of how readings should be taken.

Example - Take 2, 3, 4 or more readings at different depths and have the calculator list each reading and average one.

Head Operation: The inspector would insert head into cavity and push a button at each depth and the scanner would gather in the readings.

Example - Take the TIR reading of each pair of probes and let the calculator list each set of readings.

Head Operation: The inspector would press the foot pedal to erase the Min-Max Unit after the head is in the shell and slide the head into the bottom. When the head has reached the bottom, he would then press the button and the calculator will read the TIR for each pair of probes.

The above unit can be line located and operated without atmospheric or physical restraint to the equipment.

The measuring head or probe will read out the 9.900 minimum depth of 3.667 dimension in its entirety. The number of readouts can be determined by the Contractor to satisfy the Q. A. mode for those concerned. A 100% level is anticipated for the original production and final inspection.

Variations of this head can be used for in process checks deemed necessary.

A final automated concept for shell, in and out feed, is available - funding permitting. Manual concepts for shell handling is contemplated with the quoted equipment.

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

CATEGORY #3. ELECTRONIC GAGING - PRICING ESTIMATES.

The following lists some of the facilities available for electronic inspection banks. Pricing current January 1978.

NOTE: The Pretic Internal Groove Checking System requires the following details

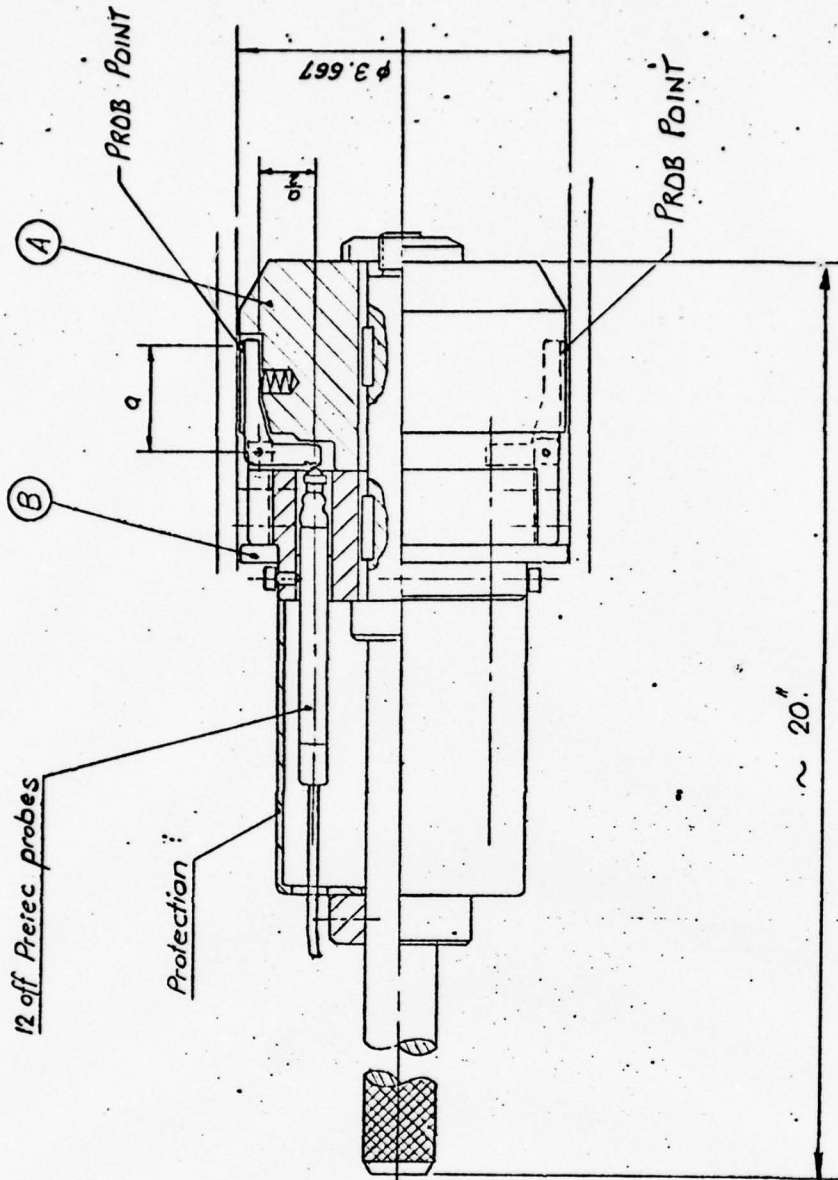
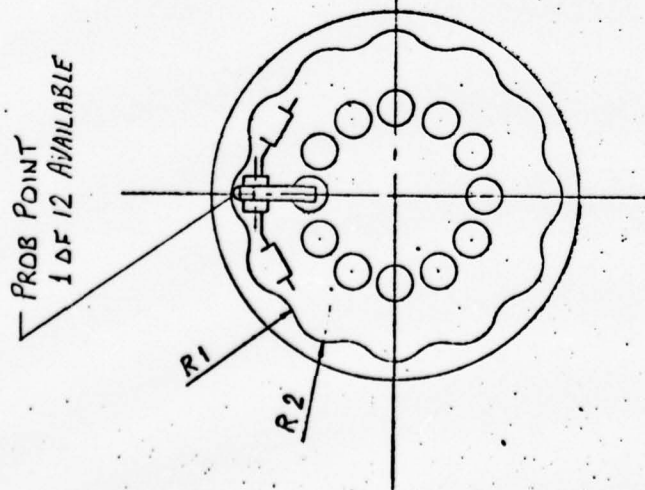
Alina Corporation
175 Sunnyside Blvd.
Plainview, N.Y. 11803

<u>ITEM</u>	<u>QUANTITY</u>	<u>DESCRIPTION</u>	<u>UNIT PRICE</u>	<u>TOTAL</u>
1.	1	Fixture per P/N 2-13919	\$ 5,340	\$ 5,340
2.	1	83 104 110 Simultaneous 10 Station Meter	2,450	2,450
3.	6	83 000 101 Amplifier (Differential)	595	3,570
4.	12	83 100 102 Standard Cartridge Probes	165	1,980
5.	6	83 100 100 Min-Max Memory Unit	495	2,970
6.	1	Foot Pedal to Erase 6 Min-Max Units Simultaneously	125	125
7.	1	Alina Scanner	1,500	1,500
8.	1	Alina Converter	1,500	1,500
9.	1	H-P Calculator with 2008 Step Memory	3,855	3,855
10.	1	H-P Interface Card 98133A	650	650
				<u>\$23,940</u>

NOTE: See proposed head on page #31.

NOTE: H-P Calculator with 2008 Step Memory and Fixture
P/N 2-13919 used in combination with the other
items listed above.

Obs! probe is indicating $\frac{1}{2}$ value of dimension



ALINA - GAGE INSIDE FLUTING

(A) Protection and guide-body in fibre-glass laminated Delrin. Same shape as inner groves.

(B) Protection Same mat. and shape as Pos. (A)

ALINA-GAGE		Product No. 1000	
Rev.	Qty.	Rev.	Qty.
1	1	1	1
2	1	2	1
3	1	3	1
4	1	4	1
5	1	5	1
6	1	6	1
7	1	7	1
8	1	8	1
9	1	9	1
10	1	10	1
11	1	11	1
12	1	12	1

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

CATEGORY #4

AIR GAUGING - SEMI & AUTO

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

CATEGORY #4. AIR GAUGING - SEMI & AUTO.

Semi to automatic gaging can be accomplished by use of a Precisionaire type, multiplex air gauge system. This system, already proven, has been used in various commercial and ordnance plants throughout the U.S.A.

The equipment could be installed in a regular line complex without restrictions.

An example of the possibilities are noted as follows using Section "F" as a reference for characteristics.

Operation #205. Inspect following Finish Turn O.D. & Bourrelet.

Eight (8) characteristics could be station gaged in a single readout with failures noted individually.

Complete automation is desired, however, limitations evidenced by operation sequencing, space and funding would vastly change or control methods adopted. Since the above are unknown, no further comment of consequence can be made.

See Final Inspection - Section "F" for AQL's and other data common to regular line inspections.

NOTE: Several companies retain expertise for the design and build requirements of these units. The design criteria are of a nature requiring specific sequencing in order to incorporate the benefits of each individual machine element.

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

SECTION "B"

SEQUENCE OF OPERATIONS & FLOW CHART

- A. PROCESS FLOW CHART
- B. OPERATION SEQUENCE & EQUIPMENT
- C. OPERATIONAL SEQUENCE

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

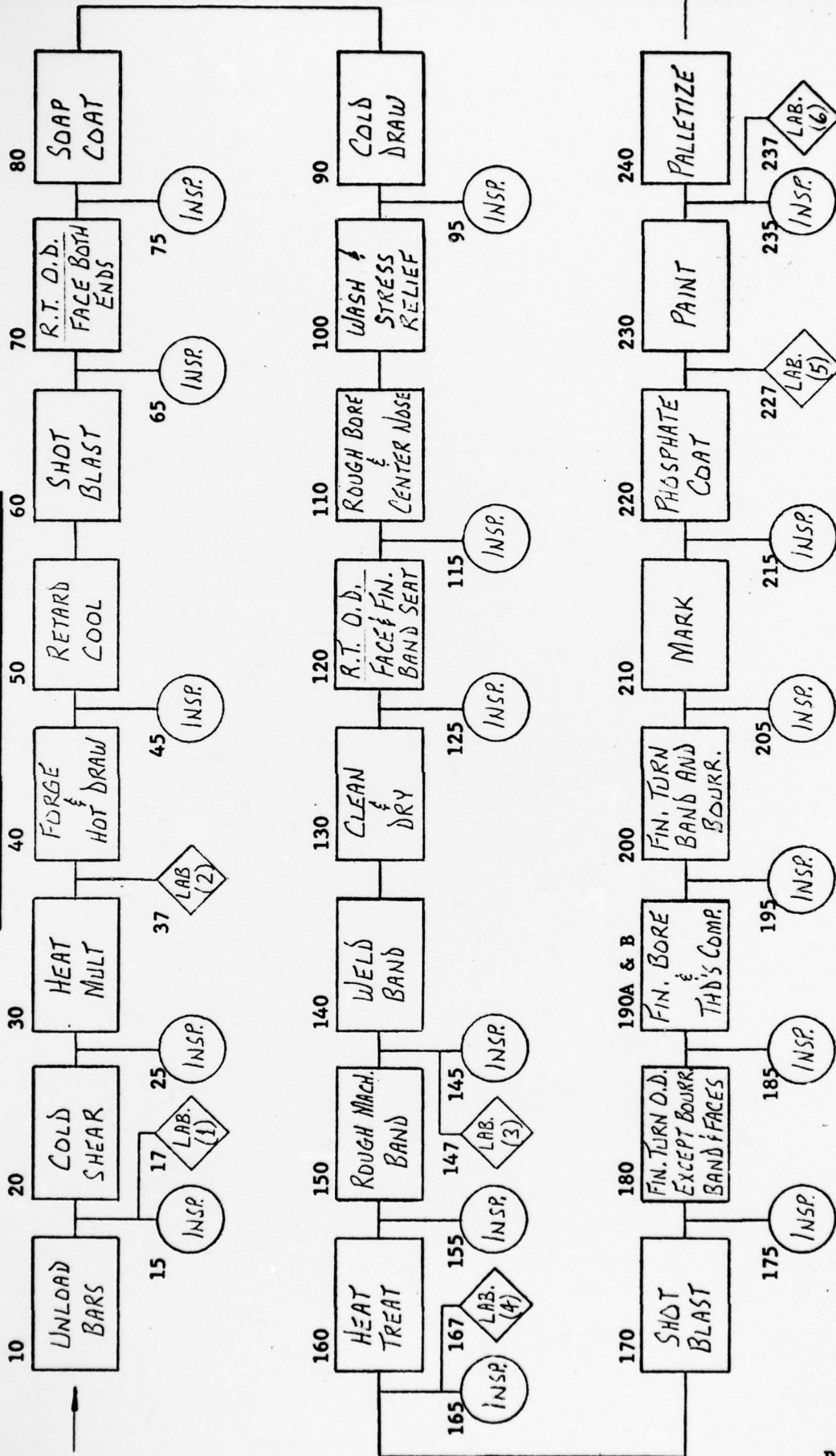
PROCESS FLOW CHART

The attached Process Flow Chart lists the various production, inspection and laboratory stations in order of their manufacturing sequence.

Each should serve to be self-explanatory and will be referenced and noted accordingly throughout this report.

The chart attached, page 36, is separate for removal and use as referenced material.

PROCESS FLOW CHART



LAB. FUNCTION — LAB. (4) — MACRO — LAB. (2) — MULT TEMP. — LAB. (3) — CHEM. ANALYSIS

LAB. (4) — BAND SEAT & TENSILE TEST

LAB. (5) — COATING WEIGHT FOR PHOSPHATE

LAB. (6) — SALT SPRAY TEST

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

OPERATIONAL SEQUENCE & EQUIPMENT

The attached sheets, Pages 38 and 39 are separate for expeditious purposes.

The operations in sequence combine the work with the facilities envisioned for use forthwith.

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

105MM XM710E1 MPTS.

OPERATIONAL SEQUENCE & EQUIPMENT

<u>OPER. NO.</u>	<u>LOCATION</u>	<u>OPERATION DESCRIPTION</u>	<u>EQUIPMENT</u>
10	St. Louis	Unload Cars	Overhead Crane
15		Inspect	
17		Lab - Macro	
20	New	Cold Shear	Buffalo Shear No. 625
25		Inspect	
30	New	Heat Mult	Westinghouse 10 Coil Induction 3000 Kw
37		Mult Heat (Lab)	Pyrometer
40	St. Louis	Forge & Hot Draw	E. W. Bliss - 4 stage - mechanical press
45		Inspect	
50	New	Retard Cool	Special Design
60	New	Shotblast	Pangborn/Dust Collectors
65		Inspect	
70	St. Louis	R.T. O.D. Face Both Ends	Wm. K. Stamets Lathe
75		Inspect	
80	New	Soap Coat	Hansen Van Winkle Munning Moore
90	New	Cold Draw	Bliss or equiv. - 600 Ton
95		Inspect	
100	New	Wash & Stress Relieve	Washer & Lindberg Furnace
110	New	Rough Bore & Center Nose	Seneca Falls Mach. Company
115		Inspect	
120	St. Louis	R.T. O.D. Faces & Finish Band Seat	Wm. K. Stamets Lathe
125		Inspect	
130	New	Wash & Dry	Automatic Wash & Dry Equip.
140	New	Weld Band	Taylor Winfield Special
145		Inspect	
150	St. Louis	Rough Machine Band	Arcade Machine & Tool Co.
155		Inspect	

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

OPERATIONAL SEQUENCE & EQUIPMENT (continued)

<u>OPER. NO.</u>	<u>LOCATION</u>	<u>OPERATION DESCRIPTION</u>	<u>EQUIPMENT</u>
160	New	Heat Treat	Furnace to suit.
165		Inspect	
167		Lab - Band Seat, Chemical Analysis & Tensile Test	Laboratory - Chemical
170	New	Shotblast	Pangborn/Dust Collectors
175		Inspect	
180	St. Louis	Finish Turn O.D.(Except Bour. Band & Faces)	Jones & Lamson Lathe
185		Inspect	
190 A&B	New	Face Bore & Thd's. Comp.	Seneca Falls Mach. Co.
195		Inspect	
200	St. Louis	Fin. Turn Band & Bour.	Wm. K. Stamets Lathe
205		Inspect	
210		Mark	Matthews Marker
215		Inspect	
220	New	Phosphate Coat	Advanced Curing Systems
227		Lab - Coating Wts. for Phosphate	Laboratory - Chemical
230	New	Paint	Binks
235		Inspect	
237		Lab - Salt Spray Test	
240		Palletize	Conveyor System

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

105MM XM710E1 MPTS.
OPERATIONAL SEQUENCE

<u>OPER. NO.</u>	<u>NO. OF SHEETS</u>	<u>OPERATION DESCRIPTION</u>
10	2	Unload Cars
15	2	Inspect
17	2	Lab - Macro
20	3	Cold Shear
25	2	Inspect
30	3	Heat Mult
37	2	Mult Heat (Lab)
40	7	Forge & Hot Draw
45	2	Inspect
50	3	Retard Cool
60	3	Shotblast
65	2	Inspect
70	5	R.T. O.D. Face Both Ends
75	2	Inspect
80	3	Soap Coat
90	3	Cold Draw
95	2	Inspect
100	3	Wash & Stress Relieve
110	5	Rough Bore & Center Nose
115	2	Inspect
120	5	R.T. O.D., Face Open End (Fin. Turn Band Seat)
125	2	Inspect
130	3	Clean & Dry
140	5	Weld Band
145	2	Inspect
147	2	Lab - Band Analysis
150	4	Rough Machine Band
155	2	Inspect

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

OPERATIONAL SEQUENCE (continued)

<u>OPER. NO.</u>	<u>NO. OF SHEETS</u>	<u>OPERATION DESCRIPTION</u>
160	3	Heat Treat
165	2	Inspect
167	4	Lab - Band Seat, Chemical Analysis & Tensile Test
170	3	Shotblast
175	2	Inspect
180	5	Fin. Turn O.D. Except Bour. Band & Face
185	2	Inspect
190 A&B	6	Fin. Bore & Thd's. Comp.
195	2	Inspect
200	5	Fin. Burn Band & Bour.
205	2	Inspect
210	3	Mark Shell
215	2	Inspect
220	3	Phosphate Coat
227	1	Lab - Coating Weight for Phosphate
230	3	Paint
235	2	Inspect
237	2	Lab - Salt Spray Test
240	1	Palletize
245	2	Inspect

(This page left blank intentionally)

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

SECTION "C"

"OPERATION PROCESS SHEETS"

OPERATIONS

RAW MATERIAL THRU FINISHED SHELL -

OPERATIONS #10 - #245 ARE INCLUDED

IN THIS SECTION.

NATIONAL PRESTO IND., INC.
3925 N. HASTINGS WAY
EAU CLAIRE, WISCONSIN 54701

CONTRACT DAAK10-78-C-0005

OPERATION PROCESS SHEETS

The "Operation Process Sheets" progressively generate the word and picture conceptals conceived for the manufacture and acceptance of the 105MM XM710E1 Projectile.

These sheets basically contain the packaged engineering and technical data developed during the item contract tenure.

The order of these listings follow primarily the aforementioned "Flow Chart" parameters and can be used as a condensed data reference thereof. See Section "B", page 36.

Basic data within each operation frame as presented herein is as follows:

1. Operation Name & Number
2. Conceptual Part Drawing & Dimensions
3. Machine Name & Type
4. Process Concepts
5. Speeds & Feeds
6. Cycle Time & Efficiency
7. Machine Tooling & Costs
8. New Machine - Modernized or Use As Is
9. Operation Inspection Criteria
10. Miscellaneous

NOTE: Inspections on these sheets could be a function of any designated personnel since all are strictly for control purposes.

Laboratory functions are noted and identified with a last digit seven (7).

In Process and Final Inspection are listed independently and shown in a corresponding manner on separate lists for expeditious purposes.

The Operation Process Sheets covering the complete phases of manufacture and inspection - Operation #10 thru Operation #240 follow:

1275 S. 3rd St.

body

1850-1851

PART

9200225

ISSUE:

SHEETS

1

30

2

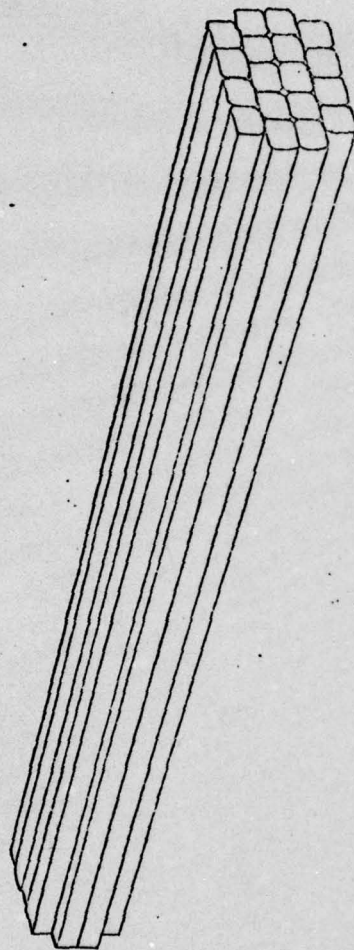
1340

100

MACHINE

NAME: 12.5 TON OVERHEAD CRANE OR EQUIV.

22
MACHINE



NOTE: SEE UNLOAD CARS SHEET, 2 OF 2

[illegible]

● ● ●

100

100

OPERATION PROCESS SHEET

DUDY

PART NAME:

PART NO.:

9270225

MACHINE NAME: 12.5 TON OVERHEAD CRANE OR EQUIV.

ISSUE: SHEET 2 OF 2

1340

MACHINE NO.:

OPERATION: UNLOAD CARS

MACHINE: OVERHEAD CRANE - 12.5 TON CAB - CONTROL TYPE - MOVING CAB OR SUITABLE SIZE.

EQUIPMENT DESCRIPTION: Overhead Rail supported system - bar from rail car to Storage Area to shearing conveyor - Oper. #20 - Cold Shear.

ESTIMATED PRODUCTION RATE/HR. & PERCENT EFFICIENCY:

Requirements pending layout of plant.

ESTIMATED COST PER UNIT:

Unit costs are not shown hereon since the real time expenditures include too many variables as associated with type of equipment, installations relative to area and steel work required for support and whether rehabilitation or new purchase overall.

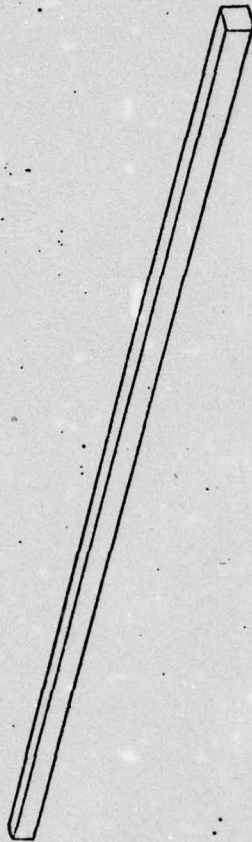
NATIONAL PRESTO INDUSTRIES, INC.
EAU CLAIRE, WISCONSIN

DRAWN BY: CHECKED BY: DATE:

10

CORPORATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: 1 OF 2
 MATERIAL: 1340 MACHINE NAME: BENCH & GAGE MACHINE NO.: _____



NOTE: See Ultrasonic Inspect
 Item #6, Page 2 of 2.

DESCRIPTION OF OPERATION		NAME OF TOOL	TOOL NO.
INSPECTION			
NATIONAL PRESTO INDUSTRIES, INC.			OPER. NO.
EAU CLAIRE, WISCONSIN			
DATE: _____			15

OPERATION PROCESS SHEET

PART NAME: DUDY PART NO.: 9250425 SHEET: 2 OF 2
 MATERIAL: 1340 MACHINE NAME: MACHINE NO.:

INSPECTION OPERATION: Following Unload Cars

Steel Bars

1. Check Heat Number.
2. Check Bar Length
3. Check Bar Width (Across & Diagonally)
4. Check Chipping & Scarfing
5. Check Straightness
6. Ultrasonic

Bars/Mults - Ultrasonic Inspection Submerged Systems

Submerged Ultrasonic System - Government Oriented scheduled for operational tryout at Louisiana Army Ammo Plant (LAAP) 1 August 1978. This system, already checked in part, is considered as the first major effort for inspection of this magnitude in a line production mode.

The above system, if proven acceptable in use, should be considered for this project.

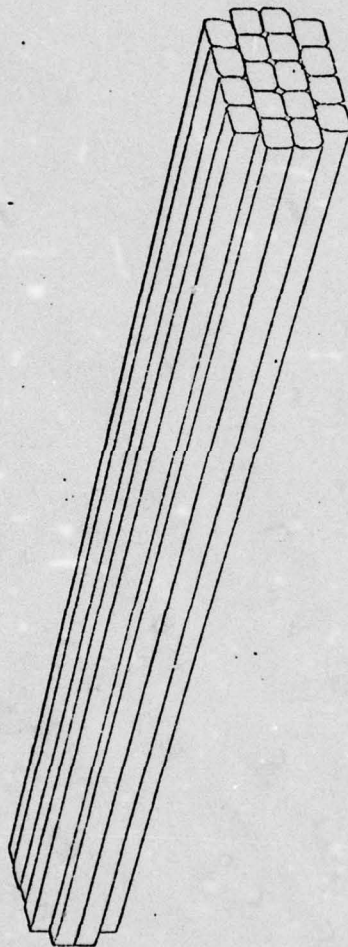
Elaboration, as required to suit the particular installation, should be a part of the consideration.

The present 155MM XM549 or any other comparable Ultrasonic Inspection System should also be investigated for possible incorporation.

Contractor and vendor commonality of terminology and purchase order requirements should be co-ordinated for mutual understanding of all paper required for:

- #1. Inspection
- #2. Certification
- #3. Record

MACHINE NO. 1



NOTE: SEE INSPECT METALLURGICAL SHEET 2 OF 2

[illegible]

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 SHEET: 2 OF 2
 MATERIAL: 1340 MACHINE NAME: BENCH & LABORATORY MACHINE NO.: _____

OPERATION: INSPECT METALLURGICAL

MACROS: Furnished by Steel Supplier.
 Visual inspect to MIL-STD-430
 for compliance of quality required.

BARS: Visual inspect for Mill Acid Pickle
 for Scale Removal.

Contractor and vendor commonality of terminology and
 purchase order requirements should be co-ordinated for
 mutual understanding of all paper required for:

- #1. Inspection
- #2. Certification
- #3. Record

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: SHEET 2 OF 3
MATERIAL: 1340 MACHINE NAME: BUFFALO SHEAR NO. 265 MACHINE NO.: NEW

OPERATION: COLD SHEAR FOR PARTING BAR INTO MULTS.

MACHINE: Buffalo No. 625 Mult Shear (or equivalent)
equipped with powered bar rack and a roll type feed table and automated
to suit customer requirements.

TIME CYCLE: 2.7 sec/shell = 1320 pcs/hr at 100% eff.
= 1056 pcs/hr at 80% eff.

WEIGHT: 22.66 \pm 2 lbs. each mult.

OPERATION PROCESS SHEET

PART NAME: BODY

9250625

PART NO.:

ISSUE: SHEET 3 OF 3

MATERIAL: 1340

MACHINE NAME:

MACHINE NO.:

OPERATION: COLD SHEAR FOR PARTING BAR INTO MULTS.

MACHINE:

BUFFALO NO. 625 - equipped with an air operated retracting back gage incorporating motorized adjustment and electrical control.

Power Bar Rack & Power Feed Table

(1) Set of Shear Blades

Est. Blade Life

Total cuts:

New Blade (8,000 x 2 edges) = 16,000
 Regrind x 6 x 20,000 per edge
 x 2 edges = 240,000
 TOTAL 256,000

Knife breakage is unpredictable, suggested a 50% factor per cut plus grinding cost. = \$.01696

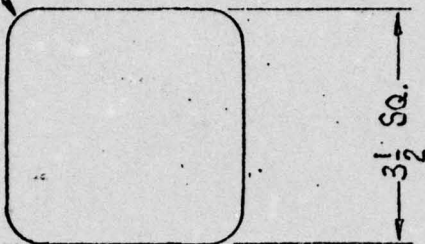
EST. COST DEC. 1975
 \$241,167.00

\$ 96,021.00

\$ 2,171.00

MACHINE NO. 1.

MACHINE NO. 1.



REF. (SEE NOTE)
5.64

1 1/2 RAD. TYP.

3-2
52.

NOTE: 22.66 ±.2 lbs. -- Pending development as required for forging & hot draw configuration.

[illegible]

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 925025 ISSUE: 1 SHEET: 1 OF 2
 MATERIAL: 1340 MACHINE NAME: BENCH & GAGES MACHINE NO.:

INSPECTION OPERATION: Following Cold Shear

INSPECT:

COLD SHEAR

1. Check Width
2. Check Length
3. Check Weight
4. Check Right Angle or Shear Cut

OPERATION PROGRESS SHEET.

13

INSU- SHE

MACHINE NO. 1 NEW

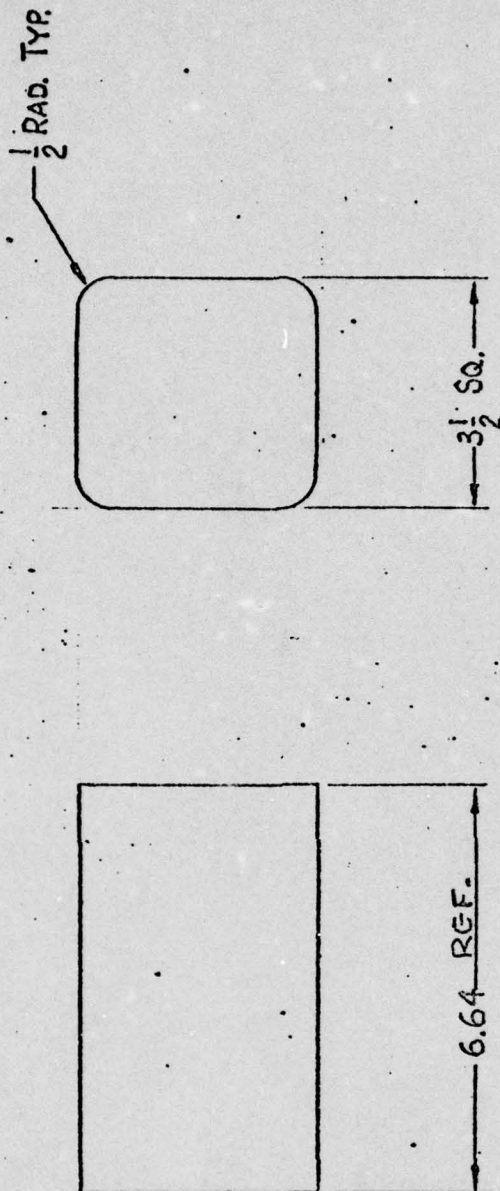
92-25

11

MACHINE NAME: WESTINGHOUSE OR EQUIV.

1340

MATERIAL:



Approx. 2000°F. or as vendor specified.
(See Heat Mult Sheet 2 of 3)

[illegible]

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 225025
 MATERIAL: 1340 MACHINE NAME: WESTINGHOUSE OR EQUIV.

ISSUE: SHEET: 2 OF
 MACHINE NO.: NEW

OPERATION: HEAT MULTS TO 2000°F.

MACHINE: Westinghouse Induction Heater System - Automated with push thru transfer System - Load & Unload and Heating synchronized to Oper. #40 - Forge.

EQUIPMENT: Westinghouse Solid State - 10 Coil Inductor 3000 Kw

CYCLE TIME: 5 sec/shell = 720 pcs/hr at 100% eff.
 = 576 pcs/hr at 65% eff.

OPERATION PROCESS SHEET

BODY

PART NAME

PART NO.

9298225

1340

MATERIAL

MACHINE NAME

WESTINGHOUSE OR EQUIV.

ISSUE

SHEET

3

OF

MACHINE NO.

NEW

OPERATION: Heat Mults to 2000°F.

EQUIPMENT: Westinghouse Solid State
10 Coil Inductor 3000 Kw

CONVEYORS: Pending installation for presses.

EST. COST

\$900,000.00 plus installation

NATIONAL PRESTO INDUSTRIES, INC. OPER. NO.

EAU CLAIRE, WISCONSIN

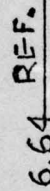
DRAWN BY

CHECKED BY

DATE

30

MACHINE NO. NEW



(See Lab Check Sheet: 2 of 2)

37

OPERATION PROCESS SHEET

PART NAME: BODY
PART NO.: 296445
MATERIAL: 1340
MACHINE NAME: WESTINGHOUSE OR EQUIV.

ISSUE: 2
SHEET: 2
MACHINE NO.: NEW

LAB CHECK

MULT TEMPERATURE: 2000°F.

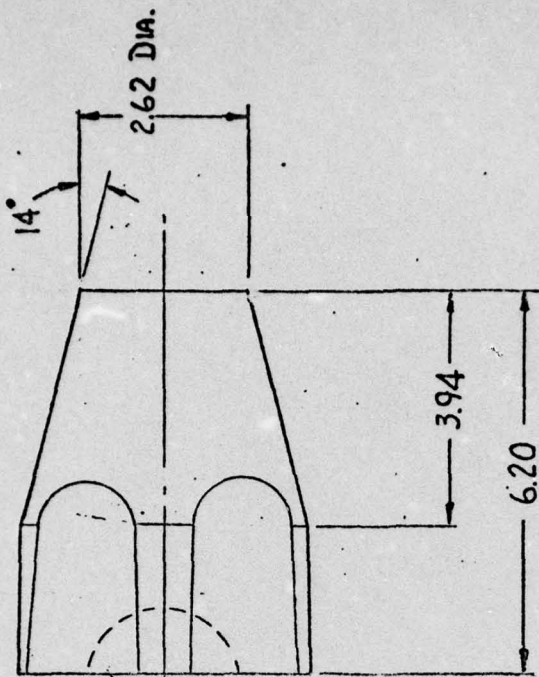
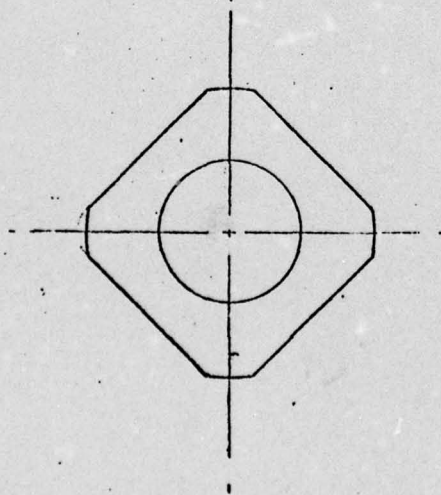
INSTRUMENT: Pyrometer of suitable instrument.

MONITOR HOURLY @ EXIT END OF HEATER.

OPERATION PROCESS SHEET.

PART NAME: COODY PART NO.: 925-225 SHI: I F: 2
 MATERIAL: 1340 MACHINE NAME: E. W. BLISS COMPANY MACHINE NO.: 1025-40910 Sht. 1 of 2
1025-40344 L-1001
 LOCATION: St. Louis

FIRST STAGE



All Dim. are Reference Only.
Develop to obtain dimension shown
on Process Sheet 40-4.

(See Forge - Four Stage - Sheet 5 of 7
& Conceptual Tool Layout - Sheet 7 of 7)

[illegible]

ISS [redacted] S [redacted] 2 OF 7
1025-40344 SER. 1 OF 2
MACHINE NO. 1025-40344 L-1001
LOCATION - St. Louis

**All Dim. are reference only...
Develop to obtain dimensions
shown on Process Sheet 40-4.**

(See Forge - Four Stage - Sheet 5 of 7
& Conceptual Tool Layout - Sheet 7 of 7)

					DESCRIPTION OF OPERATION	NAME OF TOOL	TOOL NO.
					FORGE - CABBAGE		
						NATIONAL PRESTO INDUSTRIES, INC.	OPER. #
						EAU CLAIRE, WISCONSIN	
ISS. NO.	CHG.	WAS	DATE	BY	DRAWN BY :	CHECKED BY :	DATE :
							40

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 SHEET 5 OF 7
 MATERIAL: 1340 MACHINE NAME: E. W. BLISS COMPANY MACHINE NO.: 1023-40344 L-1001
 LOCATION - ST. LOUIS

OPERATION: FORGE-FOUR STAGE (SIZE-CABBAGE-PIERCE-DRAW)

EQUIPMENT: (St. Louis) E. W. Bliss Company Forge Four-Stage - Automated and transfer sequencing thru all four stages - Auto Load & Unload. See Mfg. Operation #40 Process Description.

PROCESS: Size
 Cabbage
 Pierce
 Draw & Size Nose Thickness

CYCLE TIME: 5 seconds = 720 shell/hr. at 100% eff.
 468 shell/hr. at 65% eff.

NOTE: This press in storage - SLAAP - unassembled and as received from E. W. Bliss Company. The units have never been production mode operated or proven out. All this plus the new tooling concepts for this job thus become a major effort for this project.

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 SHEET 6 OF 7
 MATERIAL: 1340 MACHINE NAME: E. W. BLISS COMPANY MACHINE NO.: 1025-40344 Sht 1 of 2
 Location - St. Louis

OPERATION: FORGE FOUR-STAGE - Size-Cabbage-Pierce-Draw.

MACHINE: E. W. Bliss Company, Four-Stage (REWORK NOT REQUIRED) \$ 0000.00
Mechanical Press for Hot Size,
Cabbage, Pierce & Draw

TOOLING: * One set of tooling for the four stages. \$ 90,000.00

* See Following Sheet.

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9250225 SHEET: 2 OF 2
 MATERIAL: 1340 MACHINE NAME: BENCH & GAGES MACHINE NO.: _____

INSPECTION OPERATION: Following Forge Four-Stage

INSPECT:

Size

1. Tool Control
2. Visual

Cabbage

1. Tool Control
2. Visual

Pierce

1. Tool Control --Control inside contour & scallop.
2. Visual

Draw & Size Nose Thickness

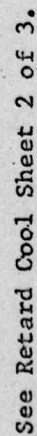
1. Check Overall Length
2. Check Nose Thickness
3. Check Conc. of Open End & Nose End
4. Check Angle (Location & Length)
5. Check Open End Dia.
6. Check Nose End Dia.
- *7. Inspect Ribs

8. Inspect Cavity & Outside Surface for Surface Defects.
9. Tool Control

*Special Equipment

Consider workable unit similar to final inspection probe shown in Category #3, Section "A", pages 27, 28, 29, 30 and 31.

MACHINE NO. NEW



△ LOCATE

[illegible]

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 929C425 SPECIAL DESIGN - RETARD COOL
 MATERIAL: 1340 MACHINE NAME: SPECIAL DESIGN - RETARD COOL
 ISSUE: 2 OF 3 MACHINE NO.: NEW

OPERATION: RETARD COOL

MACHINE: Special Design - Retard Cool, Automated with Auto Load & Unload.
 Hold shell vertical, base end down on flat continuous conveyor, thru air chamber to cool below 800°F. and then water spray to cool.

SIZE: 90" wide x 60" high x 30' long
 Line of twelve (12) shell on 6" center width and row location.

CONVEYOR SPEED: 55 min. from entry to exit.

TIME CYCLE: 4.6 sec./shell = 785 pcs./hr. at 100% eff.
 628 pcs./hr. at 80% eff.

OPERATION PROCESS SHEET

9290425

ISSUE: SHEET 3 OF 3

PART NO.:

DUDY

PART NAME:

MACHINE NO.: NEW

MACHINE NAME: SPECIAL DESIGN - RETARD COOL

MATERIAL: 1340

OPERATION: RETARD COOL

MACHINE: *SPECIAL DESIGN - RETARD COOL (Est. Cost) \$ 36,000.00

*Design to fit customer's requirements.

(C. L. R. A.) N - O C - 3 S - E T

PART NAME: BODY

PART NO.:

9298225

ISSUE: _____ SHEET: 1 OF 3

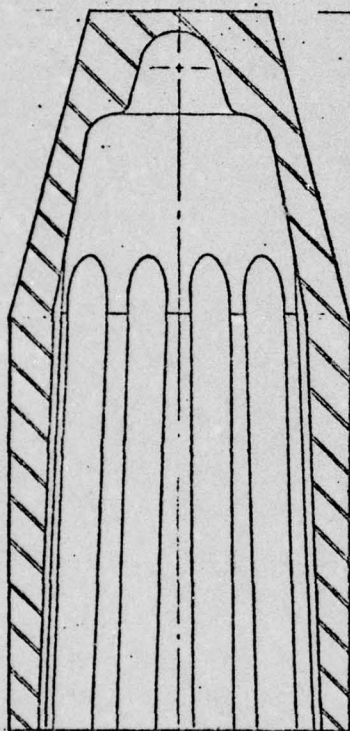
MATERIAL: 1340

MACHINE NAME: PANGBORN SHOTBLAST

MACHINE NO.: NEW

Note

POSITION OF PART TO
BE ESTABLISHED AT TIME
OF EQUIPMENT SELECTION



See Descale-Shotblast Sheet 2 of 3.

[illegible]

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 SHEET: 2 OF 3
 MATERIAL: 1340 MACHINE NAME: PANGBORN SHOTBLAST MACHINE NO.: NEW

OPERATION: SHOTBLAST I.D. - Steel Shot specified. S-390.

MACHINE: PANGBORN with dust collectors. Automated and conveyORIZED for continuous operation with forging in most suitable position for I.D. Shotblast.

SIZE: Suitable to accept forging 16" long 5½" diameter and 3" diameter I.D.

CYCLE TIME: 4 sec. shell = 900 shell/hr. at 100% eff.
 720 shell/hr. at 80% eff.

NOTE: This unit could be the same as Oper. #170 Shotblast.

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: SHEET: 3 OF 3
 MATERIAL: 1340 MACHINE NAME: PANGBORN SHOTBLAST MACHINE NO.: NEW

OPERATION: SHOTBLAST I.D.

MACHINE: PANGBORN WITH DUST COLLECTORS

or equivalent.

Install unit in most suitable position relative to subsequent operations and incoming forgings.

\$ 75,000.00

9298225

BODY

PART NAME:

PART NO. 1

1340

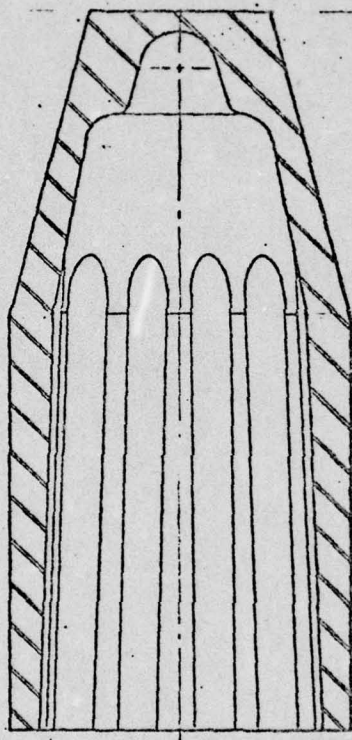
MATERIAL:

BENCH

MACHINE NAME: -

ISSUE: _____ SHEET: 1 OF 2

MACHINE NO. 1

[illegible]

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 925025 ISSUE: SHEET: OF
MATERIAL: 1340 MACHINE NAME: MACHINE NO.:

INSPECTION OPERATION: Following Shotblast I.D.

INSPECT:

SHOTBLAST I.D.

1. Check for Scale or Metal Defects.

LEAD SOURCE NUMBER

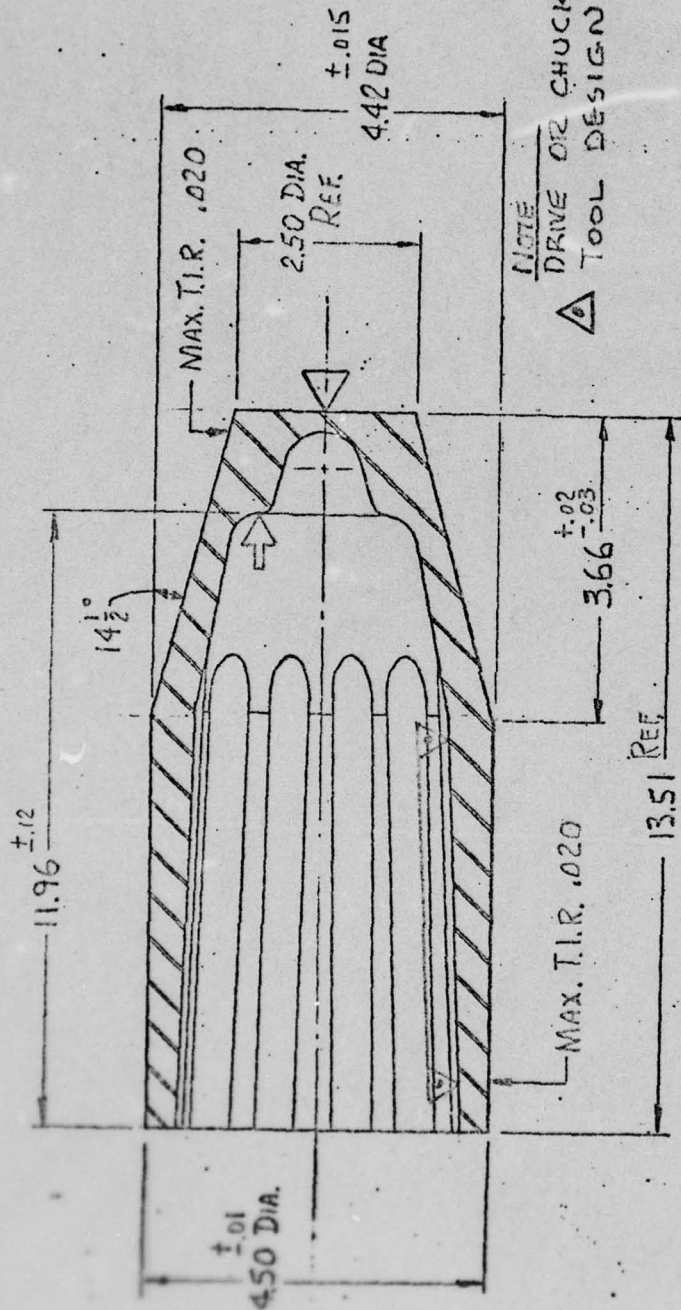
PART NO.: -

MACHINE NAME:

ISSUE: _____ SHEET: 1 OF 5

D 35460 55

MACHINE NO. 1 LOCATION - ST. LOUIS



Centralize

Chuck or Drive

Workpiece Locator

See Rough Turn & Rough Face Open End Sheet 2 of 5.

[illegible]

OPERATION PROCESS SHEET

PART NAME: DUDY PART NO.: 9290225 SHEET: 2 OF 5
 MATERIAL: 1340 MACHINE NAME: Wm. K. Stamets Company MACHINE NO.: 39 LOCATION: St. Louis

OPERATION: ROUGH TURN O.D. & ROUGH FACE OPEN END.

MACHINE: (St. Louis) Wm. K. Stamets Company, D 35460 55 & 39 - Lathe.

PROCESS: Locate - on ribbed mandrel and bottom of cavity.
 4 Tracer Controlled Tools for turning O.D.
 2 Facing or cut-off tools - on open ends.

NOTE: Excess material on open end is not cut completely off.
 A ring is left on and sheared off with a special shear arrangement on machine. (If necessary)

Spindle Speed: 365 RPM 400 S.F.P.M.

	Open End	Body
Feed Rate	.020	.020
Tool Travel	2.37	5.000
Cutting Time	19 sec.	41 sec.
Load & Unload		

CYCLE TIME: 80 sec. = 45 shell/hr. at 100% eff.
 36 shell/hr. at 80% eff.

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 SHEET: 3 OF 5
 MATERIAL: 1340 MACHINE NAME: Wm. K. Stamets Company MACHINE NO.: D 35460 55
 LOCATION: ST. LOUIS

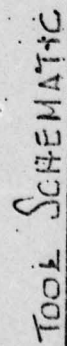
OPERATION: ROUGH TURN O.D. & ROUGH FACE OPEN END.

MACHINE REWORK: Move facing quills 5" towards spindle, tailstock lengthened, rework transfer and handling unit to take shorter shell. \$ 25,000.00

TOOLING:

	No. Required	\$ Each	\$ Total
New Mandrel	1	2,500	\$ 2,500.00
Tool holders	6	100	600.00
Templates	4	150	600.00

Location - St. Louis

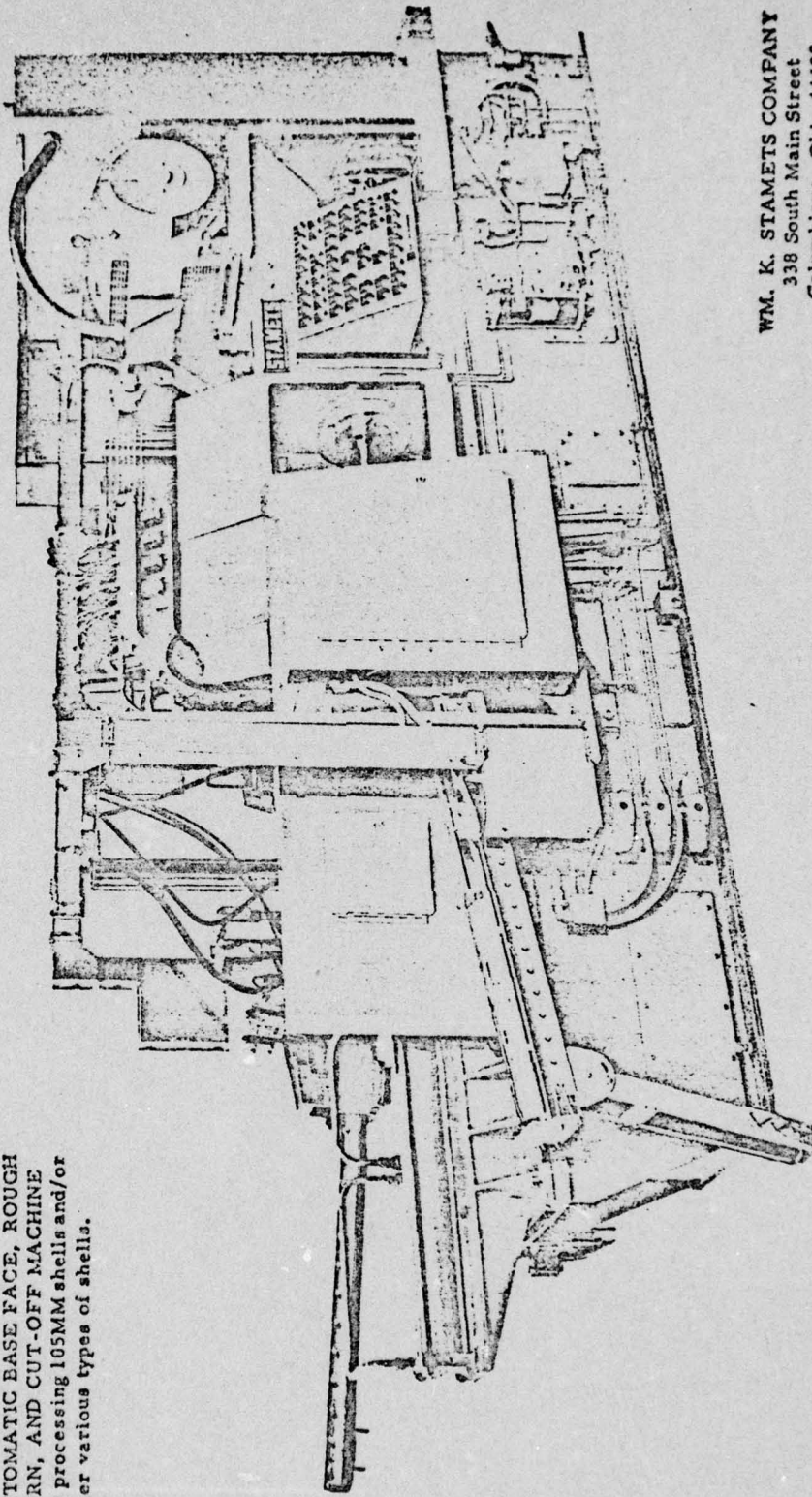
[illegible]

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: 5 OF 5
 MATERIAL: 1340 MACHINE NAME: Wm. K. Stamets Company MACHINE NO.: D 35460 55 39 LOCATION: ST. LOUIS

REFERENCE ONLY

STAMETS AUTOMATIC BASE FACE, ROUGH
 TURN, AND CUT-OFF MACHINE
 for processing 105MM shells and/or
 other various types of shells.



WM. K. STAMETS COMPANY
 338 South Main Street
 Columbiana, Ohio 44408
 PHONE: 216-482-3344

Photo No. 7209

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 ISSUE: 2 SHEET 2 OF 2
 MATERIAL: 1340 MACHINE NAME: BENCH & GAGES MACHINE NO.:

INSPECTION OPERATION: Following Rough Turn O.D. & Rough Face Open End.

INSPECT:

Rough Turn O.D. & Rough Face Open End

1. Check Conc. of Nose End & Open End.
2. Inspect Cavity & Outside Surface for Surface Defects
3. Check Dia. of Nose
4. Check Weight
5. Check Length & Angle of Nose
6. Check Overall Length
7. Check Dia. of Open End
8. Ultra-sonic Inspect I.D. & O.D.

NOTE: IF QUANTITIES OF THESE PARTS ARE EVER
 EVIDENT - AUTO GRADING SHOULD BE CONSIDERED.

NEW
MACHINE NO.:

BODY

PART NO.: -

9298225

1340

MACHINE NAME:

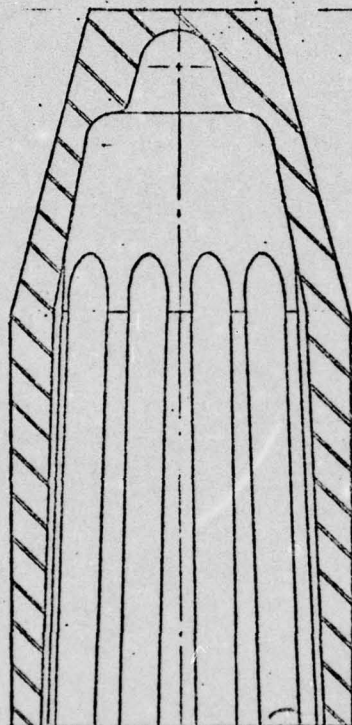
HANSEN VAN WINKLE MUNNING OR EQUIV.

ISSUE: _____ SHEET: 1 OF 3

NEW
MACHINE NO.:

NOTE

△ LOCATE OR HOLD
HORIZONTAL OR TO
SUIT EQUIPMENT
CRITERIA & OPERATION
MODE.



See Pickle, Phosphate & Lubricate Sheet 2 of 3.

[illegible]

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 MACHINE NAME: HANSEN VAN WINKLE MUNNING OR EQUIV. ISSUE: SHEET 2 OF 3 MACHINE NO.: NEW

OPERATION: PICKLE, PHOSPHATE & LUBRICATE.
 MACHINE: HANSON VAN WINKLE MUNNING - Automated & conveyORIZED for continuous operation-
 LOCATE:: HOLDING SHELL HORIZONTAL ON RACKS.

- | | | |
|----------|------------------------------|---|
| PROCESS: | 1. Cold Water Rinse | 8. Cold Water Rinse - Imm. |
| | 2. Clean Ridoline #73 - Imm. | 9. Cold Water Rinse - Imm. |
| | 3. Cold Water Rinse - Imm. | 10. Hot Water Rinse - Imm. |
| | 4. Same as Tank #2 | 11. Phos. Coat Granodraw #1-#10 - Imm. |
| | 5. Hot Water Rinse - Imm. | 12. Cold Water Rinse - Imm. |
| | 6. Hot Water Rinse - Imm. | 13. Neutralize #7 - Imm. |
| | 7. Hydrochloric Pickle | 14. Reactive Lube, Granalube #14 - Imm. |

SIZE: 14' Wide x 14'6" High x 54' Long.

CYCLE TIME: 48 seconds = 900 shell/hr. at 100% eff. (12 units/rack)
 720 shell/hr. at 80% eff.

NOTE: Chemical compounding or concentration verifications can be assigned to suit contractor methodology.

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 SHEET: 3 OF 3
 MATERIAL: 1340 MACHINE NAME: HANSEN VAN WINKLE MUNNING OR EQUIV. MACHINE NO.: NEW

OPERATION: PICKLE, PHOSPHATE & LUBRICATE.

MACHINE: HANSEN VAN WINKLE MUNNING
or equivalent.

\$204,511.00 each

COST TO CHARGE PER MACHINE:

TANKS. NUMBER	2	-	\$	112.00
"	4	-		112.00
"	7	-		205.00
"	11	-		252.00
"	13	-		1.20
"	14	-		397.50
				<u>\$1,077.70</u>

\$ 1,077.70

OPERATION PROCESS SHEET

PART NAME: BODY PART NO.: 9298225 SHEET: 2 OF 3
 MATERIAL: 1340 MACHINE NAME: BLISS 400 TON OR EQUIV. MACHINE NO.: NEW

OPERATION: COLD DRAW

MACHINE: Draw Press.

EQUIPMENT: (New) Bliss or equivalent - 400 Ton Horizontal Hyd.
 48" Stroke with 48" x 48" Bed.

PROCESS: Push rough turned part thru die with finished size
 punch, located in forge formed cavity, forming
 cavity to size and leaving stock for O.D. machining.

CYCLE TIME: 5.2 seconds = 692 pcs./hr. at 100% eff.
 554 pcs./hr. at 80% eff.

OPERATION PROCESS SHEET

PART NAME: BODY

PART NO.:

9298225

MACHINE NAME:

MATERIAL: 1340

BLISS 400 TON OR EQUIV.

ISSUE:

SHEET: 3

OF

MACHINE NO.: NEW

OPERATION: COLD DRAW

EQUIPMENT & ESTIMATED COST - NEW:

Bliss or equivalent -
400 Ton Horiz. Hyd. 48" Stroke
with 48' x 48' bed.

\$525,000.00 each

TOOLING:

Punch Holder
Draw Punch
Die
Die Plates
Stripper
& etc.

Set

\$ 10,500.00

